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(54) **Post-foaming gel product**

(57) A stable, post-foaming gel product suitable for shower use comprises a soap-free, surfactant-based gel composition comprising a major amount of water, about 3-23% by weight of a water-soluble anionic alkali metal C<sub>10</sub>-C<sub>16</sub> alkyl ether sulphate surfactant, about 1-24% by weight of a water dispersible ethoxylated fatty alcohol or fatty ester, and about 5-20% by weight of a saturated aliphatic hydrocarbon foaming agent having 4 to 5 carbon atoms as an integral part of the gel structure, the anionic surfactant and the ethoxylated fatty alcohol or ester being present in a weight ratio of 4:1 to about 1:4.

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POST-FOAMING GEL PRODUCT

5 This invention relates to a post-foaming gel based  
on an aqueous soap-free, surfactant-containing gel  
system. Preferred embodiments contain a 2:1 blend of n-  
pentane and iso-butane foaming agent as an integral  
part of the gel structure and are capable of producing  
increased volume and speed of foaming over conventional  
shower gels, and can be packaged in any form of barrier  
10 pack or container which will withstand pressure.

Conventional skin cleansing liquid products and  
shower gels are usually thick liquids, packed in  
bottles, which are relatively slow foaming and produce  
very little, relatively weak foam which quickly  
15 flattens. Post-foaming gels such as shaving gels, use  
a soap-based system which may optionally contain a  
minor amount of surfactant. Prior art post-foaming gel  
shower products consist of conventionally thickened  
sodium lauryl ether sulphate (SLES) and fatty acid  
20 diethanolamide (CDEA) blended together with a low level  
of foaming agent, such as the liquified hydrocarbon and  
chlorofluorohydrocarbon propellants. A number of major  
problems are associated with this type of product. The  
gel provides a stringy, tacky feel; possesses very poor  
25 high temperature stability; is restricted to very low  
levels of foaming agent due to the thinning effect of  
foaming agents on the thickened SLES/CDEA base, which  
results in non-optimization of foaming properties; and  
the need for high viscosity bases to allow for thinning  
30 effect on the base from the foaming agent while still  
retaining a good gel provides process difficulties when  
handling such viscous bases.

It has now been found that all or some of the  
aforediscussed problems and limitations of previous  
post-foaming shower products may be overcome by the  
present invention which provides a post-foaming gel,  
5 suitable for shower use, which rapidly develops copious  
amounts of foam.

The use of an aqueous soap-based post-foaming gel  
in personal care products such as shaving creams,  
shampoos and skin cleansing products is well known in  
10 the art as disclosed in US Patent No. 2,995,521 wherein  
is disclosed a thick aqueous soap composition with a  
liquified aliphatic hydrocarbon foaming agent.

US Patent No. 3,541,581 discloses an aqueous,  
preferably soap-based post-foaming gel, which may  
15 contain a nonionic or anionic surfactant-either in  
addition to the soap or instead thereof and,  
optionally, a water soluble gelling agent, and a liquid  
post-foaming propellant packaged in an aerosol  
dispenser wherein the active ingredients are separated  
20 from the propellant by a collapsible bag to avoid  
undesirable premature foaming.

British Patent No. 1,444,334, discloses post-  
foaming aqueous, soap-based shaving gel compositions  
containing 0.5-8% of a water-soluble hydroxy alkyl  
25 cellulose or polyoxyalkylene gelling agent and  
optionally a nonionic or anionic surfactant; and 0.5-5%  
by weight of a post-foaming aliphatic and/or  
halogenated hydrocarbon agent; packaged in a  
conventional aerosol foam dispenser with a pressurised  
30 gas propellant in the head space to discharge the  
shaving gel.

US Patent No. 4,405,489 discloses a process and  
apparatus for the production of a stable aqueous post-

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foaming gel for packaging, based on an aqueous soap-containing gel, preferably a soap based gel, and a post-foaming agent by intimately mixing and passing the mixture to a filling-machine for introduction into a container, using a continuous flow system under pressure and maintaining the mixture for a time and at a temperature and pressure sufficient to produce a post-foaming gel prior to the filling machine. A preferred additional ingredient is an oil sparingly soluble in water, such as a nonvolatile oily hydrocarbon and/or a liquid fatty alcohol and/or a fatty ester. The post-foaming gel comprises 40-80% water, 10-25% soap and 1.5-4% post-foaming agent, and about 0.25-1.5% oil.

Canadian Patent No. 1,021,264 discloses anhydrous self-foaming shampoo compositions comprising 10-80% organic solvent (trichlorofluoromethane), which also functions as the foaming agent, 10-50% anionic or cationic surfactant and 0.1-15% of a film forming resin insoluble in water (methacrylate polymers, etc), dispensed from a container as a liquid which forms a copious foam, when applied to wet hair at a temperature of about 75°F (24°C) and above.

High-foaming anhydrous liquid detergent compositions, for use as shampoos, are also disclosed in US Patent No. 3,728,265. They contain 10-25% of a liquified aliphatic hydrocarbon or halogenated hydrocarbon (propane, butane, etc) dissolved in 1-25% organic solvent such as propylene glycol (water soluble), 30-45% anionic surfactant and 5-25% C<sub>6</sub>-C<sub>12</sub> fatty acid alkanolamide, packaged in a non-pressurised container, which produces profuse foam when mixed with water.

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US Patent No. 3,705,855 discloses a pressurised water-in-oil emulsion which reverses to a stable oil-in-water emulsion and can foam a finite time after discharge from an aerosol container to be used as a shaving cream, said emulsion comprising two immiscible liquids in emulsified form having water in the dispersed phase and propellant in the continuous phase. The ingredients in the emulsion include a water-in-oil emulsifier such as sorbitan fatty acid esters, and nonionic and/or anionic water soluble surfactants.

US Patent No. 3,962,150 discloses an aerated, low density (0.01-0.10gm/ml) aqueous, non-pressurised, foam-producing, skin cleansing composition consisting of anionic and nonionic surfactants, 1-15% of an alcoholic solvent and 70-98% water, and having a viscosity of 0.5 to 300cps. The foam is extruded from the dispenser by squeezing the container causing the aqueous solution to leave the reservoir and enter an air-mixing or foaming chamber via an internal dip tube, wherein the foam is produced and passed through a homogenising element to provide a foam of a uniform consistency when discharged from the container.

None of the aforesaid prior art discloses a post-forming gel shower product based on an aqueous soap-free, surfactant-containing gel system containing an anionic alkali metal C<sub>10</sub>-C<sub>16</sub> alkyl ether sulphate surfactant, a water dispersible nonionic ethoxylated fatty alcohol or fatty ester, and about 5-20% by weight of a 2:1 blend of n-pentane and iso-butane foaming agent as an integral part of the gel structure. The anionic surfactant and the ethoxylated fatty alcohol or ester are present in a weight ratio of about 4:1 to about 1:4.

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It has now been found that the base of the gelling system of the present invention, which consists of an anionic alkali metal C<sub>10</sub>-C<sub>16</sub> alkyl ether sulphate surfactant, a water dispersible nonionic ethoxylated fatty alcohol or fatty ester, and optionally preferred mono-or disaccharide, has a relatively thin viscosity, on the order of 100-1000cps, prior to the addition of the foaming agent. Contrary to this, previous post-foaming gels have had base viscosities as high as 30,000 to 35,000cps to allow for thinning action of the foaming agent.

A major advantage of this invention over previous post-foaming shower products is that the foaming agent forms an integral part of the gel structure and has no thinning effect. This means that no limitation is placed on the level of foaming agent that may be used, which is essential in order to optimise foaming characteristics.

Accordingly, the present invention enables the preparation of a post-foaming shower gel with a gel system based on an aqueous soap-free, surfactant-containing composition and a 2:1 blend of n-pentane and iso-butane foaming agent as an integral part of the gel structure.

The invention also enables the provision of a clear or opaque ringing to soft post-foaming gel for shower use, which rapidly develops a copious amount of foam.

The invention further enables the provision of a post-foaming gel having good high and lower temperature stability.

The invention also enables the provision of a stable post-foaming gel having good skin feel

characteristics.

The invention further enables the provision of a post-foaming gel which can be packaged in any form of container which will withstand pressure.

5       The invention also enables the provision of a post-foaming gel which ends the need for an outer propellant and is more conducive for shower use.

Additional objects, advantages and novel features of the invention will be set forth in part in the  
10 description which follows, and in part will become apparent upon examination of the following specification or may be learned by practice of this invention.

To achieve the foregoing and other objects in  
15 accordance with the present invention as embodied and broadly described herein, the stable, high foaming post-foaming gel product, suitable for shower use, of this invention comprises a soap-free, surfactant-based gel composition consisting essentially of a major  
20 amount of water, about 3-23% by weight of an anionic alkali metal C<sub>10</sub>-C<sub>16</sub> alkyl ether sulphate surfactant, about 1-24% by weight of a water dispersible nonionic ethoxylated fatty alcohol or fatty ester, and about 5-20% by weight of a saturated aliphatic hydrocarbon  
25 foaming agent having 4 to 5 carbon atoms as an integral part of the gel structure. The anionic surfactant and the ethoxylated fatty alcohol or ester are present in a weight ratio of about 4:1 to about 1:4. Optionally preferred ingredients are about 1-10% of a mono- or  
30 disaccharide, and about 2-4% isopropyl myristate. More specifically, preferred post-foaming gel compositions of the present invention comprise a thin liquid base consisting essentially of, by weight, about 60-70%

water, about 4-26% anionic alkali metal C<sub>10</sub>-C<sub>16</sub> alkyl ether sulphate surfactant, about 1-25% of water dispersible nonionic ethoxylated fatty alcohol or fatty ester, gelled with a hydrocarbon foaming agent preferably in the weight ratio of 90% base to 10% foaming agent. A preferred foaming agent consists of a 2:1 blend of n-pentane and iso-butane. The anionic surfactant and the ethoxylated fatty alcohol or ester are present in a weight ratio of about 4:1 to about 1:4.

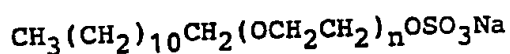
Post-foaming gel products of the invention are stable at elevated temperatures, are firm, clear or opaque ringing to soft gels with significantly improved rapid development of foam in copious amounts; and can be packaged in any form of barrier pack or container which will withstand pressure such as a plastic container with an inflatable rubber bag inside, which forms a self-pressurised spray container. This terminates the need for an outer propellant and is more conducive for shower use.

The major essential component of this post-foaming shower gel is in many embodiments about 60-75% water by weight of the gel base which may be deionized or distilled water. The water component is essential in the preparation of present stable shower gel having superior foaming properties and capable of being readily rinsed from the skin. The water possesses adequate compatibility with the other essential ingredients in the post-foaming gel composition.

An essential ingredient in the present surfactant-based gel which is soap-free is a water soluble anionic alkali metal C<sub>10</sub>-C<sub>16</sub> alkyl ether sulphate surfactant in an amount of about 3-23% by weight of the total



composition, and preferably about 4-26% by weight of the gel base (minus the foaming agent). The preferred anionic surfactant is sodium lauryl ether sulphate which is defined as a sodium salt of sulphated ethoxylated lauryl alcohol conforming generally to the formula:



where n averages between 1 and 4 and is preferably 2.

Gels have been prepared with a base consisting of 25 to 28% SLES (2EO) and water, and gassed with a hydrocarbon blend in the ratio of 90% base to 10% 2:1 blend. Although gels have formed they have been relatively soft and weak and have taken up to 168 hours (7 days) to develop. Below 25% SLES (2EO) no gelling occurs. By increasing the number of moles of ethylene oxide on the SLES it is possible to reduce the level of SLES. While these high concentrations of SLES produce gels, they provide no skin feel, are relatively harsh, which may produce problems with irritancy and have poor relative stability within the container. Thus, the inclusion of additional materials is necessary to develop a marketable product.

Another essential ingredient in the gelling system of surfactant-containing post-foaming gels is a water dispersible nonionic ethoxylated fatty alcohol or fatty ester in an amount of about 1-24% by weight of the total composition, and preferably about 1-25% by weight of the gel base. Above 25%, the ungassed liquid base develops a soft gel structure on standing which leads to process difficulties. No restriction is placed on the degree of ethoxylation. Suitable chemicals from

the above classifications should be either partially insoluble/soluble or dispersible in water. Materials which are completely soluble at all temperatures or completely insoluble at all temperatures do not form satisfactory gels. Typical examples of water dispersible nonionic ethoxylated fatty alcohols and fatty esters which form gels include polyoxyethylene (4) lauryl alcohol (BRIJ 30), polyoxyethylene (20) sorbitan monostearate (TWEEN 60), polyoxyethylene (20) sorbitan trioleate (TWEEN 85), polyoxyethylene sorbitan mono-oleate (TWEEN 81), polyoxyethylene sorbitan monolaurate (TWEEN 21), polyoxyethylene glycerol monolaurate (TAGAT L2), polyoxyethylene glycerol mono-oleate (TAGAT O2), polyoxyethylene glycerol castor oil (TAGAT R60), polyethylene (6000) glycol (PEG 6000), polyoxyethylene (40) sorbitol septaoleate (ARLATONE T), polyoxyethylene sorbitol hexaoleate (ATLAS G 1086), and an ethoxylated lanolin alcohol. (The words BRIJ, TWEEN, TAGAT, ARLATONE and ATLAS are trademarks.) An ethoxylated lanolin alcohol is defined as the polyethylene glycol ether of lanolin alcohol with an ethoxylation value of 5 to 75. The preferred ethoxylated lanolin alcohol is the polyethylene glycol ether of lanolin alcohol with an ethoxylation value of 15, also known and commercially available as POLYCHOL 15 by the Croda Company. (The word POLYCHOL is a trade mark.) It is a solid product which melts when heated at a temperature of 60-65°C in an aqueous medium. The presence of this water dispersible nonionic ingredient provides the skin with a good soft feel, improved stability as well as improved gel structure and rate of gelling.

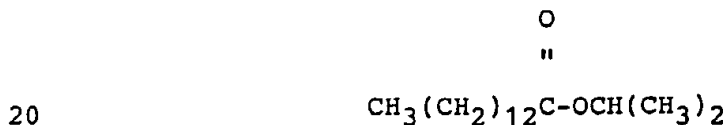
The final essential ingredient in soap-free,

aqueous post-foaming surfactant-based gel compositions of the present invention is a post-foaming agent comprising one or more saturated aliphatic hydrocarbons having from 4 to 5 carbon atoms, usually present in an amount of about 5-20% by weight. The hydrocarbon(s) may be selected from n-butane, iso-butane, n-pentane, iso-pentane, and preferably mixtures thereof. The preferred foaming agent is a 2:1 blend of n-pentane and iso-butane. N-pentane is a colourless liquid, having a density of 0.634 and a boiling point of 36°C. Iso-pentane is also a colourless liquid, has a density of 0.622 and a boiling point of 30°C. N-butane is a colourless gas having a boiling point of 1°C. Iso-butane is also a colourless gas having a boiling point of -11°C. The addition of the hydrocarbon foaming agent to the liquid base, which does not gel on prolonged standing, develops a gel structure. A microemulsion is formed with the hydrocarbon foaming agent blended in the base material. The foaming agent is an integral part of the gel structure, and therefore has no thinning effect on the gel as in prior art post foaming gels. Consequently, the need to limit the amount of the foaming agent to low levels in the formation of a post-foaming gel has been eliminated. Accordingly, no limitation is placed on the level of foaming agent used, which is essential in order to optimise foaming characteristics. The preferred ratio of foaming agent to the gel base is 10% to 90% by weight of the finished product.

A desirable additive in present gel system is a mono- or disaccharide such as fructose, galactose, sucrose and glucose in an amount of about 1-10% by weight of the composition. A monosaccharide is a

hexose or pentose, in general an aldehyde-alcohol or ketone-alcohol such as sorbitol. A disaccharide is a carbohydrate yielding 2 monosaccharides on hydrolysis, such as lactose. Sorbitol is a hexahydric alcohol  
 5 having the formula  $C_6H_{14}O_6$ , is in the form of colourless crystals having a melting point of  $111^\circ C$  and is soluble in water. It is a hygroscopic compound which functions as a humectant, to ensure the absorption of a certain amount of atmospheric moisture  
 10 by the surfactant-based gel of present invention, and increases the gel formation rate.

Another preferred additive in present gel base is isopropyl myristate in the amount of about 2-4% by weight of the gel base, which is defined as an ester of  
 15 isopropyl alcohol and myristic acid and conforms generally to the formula:



The commercial product usually appears as a mixture of myristate with small amounts of esters of palmitic and other saturated fatty acids. It is a  
 25 practically odourless liquid of low viscosity; it solidifies at about  $3^\circ C$ ; and it is practically insoluble in water, but soluble in organic solvents and in ethanol, acetone, mineral oil, etc. It dissolves many waxes, cholesterol and lanolin, and it is readily  
 30 absorbed through the skin.

The coaction of the aforescribed essential components unexpectedly provides a post-foaming gel shower product which optimises foaming characteristics

both as to increased volume and as to speed of foaming, and provides high temperature stability and a smooth, pleasant feel to the skin, and simplifies packaging of the product. The present post-foaming shower gel compositions of this invention have overcome a number of major problems associated with this type of product. The omission of a single essential component adversely effects the unique properties of the total composition. Accordingly, the criticality of the essential ingredients and the specificity of each ingredient is necessary in formulation of the present novel post-foaming shower gel product.

An in vitro method of producing foam which is as close as possible in texture and volume to the foam created in normal use of the shower gel, shows that a maximum foam volume of 165 cm<sup>3</sup> is generated after approximately 40-45 seconds using a 10g sample of the gel of Example 2, hereinafter disclosed, as set form in Table I. The method used comprises placing 10g of gel in the centre of a fixed lower polystyrene disc, 20cm in diameter and preferably 2.5cm thick, held stationary on a lab jack. An upper movable similar polystyrene disc is attached to the shaft of a laboratory stirrer, set to 120rpm. The movable upper disc is lowered until the gap between the upper and lower disc is 4mm and is rotated for 45 seconds. The results are shown in Table I.

Table I

	<u>TIME OF DISC</u> <u>ROTATION (Secs)</u>	<u>RUN</u>			<u>MEAN</u>
		(1)	(2)	(3)	
	30	140cm <sup>3</sup>	140cm <sup>3</sup>	140cm <sup>3</sup>	140 cm <sup>3</sup>
5	35	140	165	140	148.3cm <sup>3</sup>
	40	165	165	165	165 cm <sup>3</sup>
	45	140	165	165	156.6cm <sup>3</sup>
	50	165	165	165	165 cm <sup>3</sup>
	60	165	165	165	165 cm <sup>3</sup>
10	70	165	165	165	165 cm <sup>3</sup>
	80	165	165	165	165 cm <sup>3</sup>
	90	165	165	165	165 cm <sup>3</sup>
	100	140	165	165	156.6cm <sup>3</sup>
	110	190	165	190	181.6cm <sup>3</sup>
15	120	165	165	165	165 cm <sup>3</sup>

This table clearly shows that a substantial amount of foam (140cm<sup>3</sup>) is generated after 30 seconds of shear, which increases in 40 seconds to 165cm<sup>3</sup> and lasts at said level for 120 seconds. It may be found that certain gels require slightly longer shear times to produce a satisfactory foam due to the varying levels and types of foaming agent used in various gels. For example, a gel containing a foaming agent with relatively low volatility will require a greater amount of work to bring about foaming.

The density of the finished gel is approximately 1 g.cm<sup>-3</sup>. There is therefore, an approximately 16 fold increase in volume upon shearing the gel to its max.

However, the speed at which the maximum foam volume is achieved can be varied via adjustment of the hydrocarbon foaming agent type and quantity.

Foam development time can be controlled by adjustment of the hydrocarbon foaming agent type and level and also via adjustment of the formulation to

generate a softer or stiffer gel. A preferred gel consists of a gel which on extrusion from the package will begin to foam slightly, almost immediately. Complete foam generation does not take place until the gel is subject to shear. Although foam characteristics  
 5 are variable and can be controlled relatively easily by additives or hydrocarbon foaming agent level, an approx. foam profile is as follows:-

Density of foam  $0.09\text{gcm}^{-3}$

10 Viscosity of foam 11.500cps (sp TB at 5rmp)

Foam is produced by the method described above for foam generation. Foam density is measured by placing foam in a small plastic cup of known weight and volume. The foam is levelled to the top of the cup with a  
 15 palette knife and the full cup weighed. Foam density is then calculated in the normal way.

Foam viscosity is measured on foam, as generated above, using the Brookfield RVT Heliopath viscometer in the normal manner at a temperature of 20-25 °C. (T-bar  
 20 spindle 36mm, at 20rpm). The foam should be soft and uniform throughout with relatively open texture yet still perceivable as creamy (unlike a soap derived foam with a tight, very rich texture). Due to the nature of the product, in that it foams immediately upon  
 25 shearing, it is very difficult to accurately measure the gel viscosity. An approximate viscosity lies between the range of 20,000 to 100,000cps.

The above in vitro evaluation test for the foaming shower gel is not suitable for conventional shower  
 30 gels. However, in vivo shower testing comparing the foaming shower gel against a conventional shower gel has shown significantly more foam and speed of foaming from foaming shower gel than with conventional shower gel, as shown in Table II and Table III using a scale of 0-10.

Table II

<u>Properties</u>		<u>MEAN</u>		<u>T</u>	<u>SIG</u>
		A	B		
5	1. Spreadability of gel	6.76	5.33	1.97	n.s
	2. Speed of foaming	6.85	2.76	6.37	sig@<0.1%
	3. Amount of foam produced	6.42	2.57	6.97	sig@<0.1%
	4. Feel on skin during				
	bathing	6.61	3.71	5.68	sig@<0.1%
10	5. Creaminess of foam				
	produced	6.61	2.71	7.93	sig@<0.1%
	6. Lasting properties of				
	foam	5.47	2.71	5.4	sig@<0.1%
15	7. Perseverance of foam				
	generation	5.38	2.95	4.85	sig@<0.1%
	8. Strength of fragrance				
	during use	5.28	4.23	1.63	n.s
	9. Ease of rinsing	6.38	5.42	1.05	n.s.
20	10. Feel of skin after				
	bathing	6.00	4.61	2.18	sig@<5%
	11. Stickiness of skin	3.47	2.38	1.62	n.s
	after drying				
	12. Softness of skin after				
	after drying	5.38	4.47	1.33	n.s
25	13. Smoothness of skin				
	after drying	5.66	4.66	1.49	n.s
	14. Freshness of skin				
	after drying	5.61	4.33	2.03	n.s

30

A - Foaming Shower Gel

B - Conventional Shower Gel



Table III

	<u>Properties</u>	<u>MEAN</u>		<u>T</u>	<u>SIG</u>
		A	B		
5	1. Spreadability of gel	6.85	5.15	2.74	sig@<2%
	2. Speed of foaming	7.4	2.4	9.13	sig@<0.1%
	3. Amount of foam produced	6.65	2.09	7.27	sig@<0.1%
	4. Feel on skin during bathing	6.65	4.65	4.53	sig@<0.1%
10	5. Creaminess of foam produced	7.3	2.25	8.6	sig@<0.1%
	6. Lasting properties of foam	5.8	2.15	5.65	sig@<0.1%
	7. Perseverance of foam generation	5.7	2.2	5.63	sig@<0.1%
15	8. Strength of fragrance during use	5.05	4.05	2.15	sig@<0.1%
	9. Ease of rinsing	6.15	6.2	0.1	n.s
	10. Feel of skin after breathing	5.6	5.7	0.35	n.s
20	11. Stickiness of skin after drying	3.15	3.4	1.1	n.s
	12. Softness of skin after drying	5.85	5.95	0.49	n.s
25	13. Smoothness of skin after drying	5.95	6.25	0.92	n.s
	14. Freshness of skin after drying	6.1	5.85	0.73	n.s

30

A - Foaming Shower Gel  
 B - Conventional Shower Gel  
 (Alternative Mild Formulation)

Post-foaming shower gel compositions of this invention also may contain minor amounts of conventional additional components to impart any desired characteristic, which are compatible with the gel and do not adversely affect the gel structure. Suitable additives include colouring agents, perfumes, preservatives, antiseptic agents and the like. These additives generally constitute a maximum of 5% and preferably 2% by weight of the composition. The presence of a soap adversely affects the foaming characteristics of the shower gel, which requires the present gel product to be soap-free.

The pH value of the base of the foaming shower gel is usually in the range of 5.0 to 9.5 dependent on the formulation. Addition of hydrocarbon foaming agent to the base is not expected to change its pH value.

Post-foaming gels of present invention are preparable by forming a homogenous liquid base dispersion containing the water, the nonionic ethoxylated fatty alcohol or fatty ester, the anionic surfactant and preferably the mono-or disaccharide and the isopropyl myristate; mixing the liquid base with the hydrocarbon foaming agent under pressure to form a post-foaming gel wherein the foaming agent is an integral part of the gel structure. The gel is maintained under pressure during the packaging into a container that will withstand pressure.

The current process for the manufacture of a post foaming shower gel involves the continuous pumping of the thin liquid base at a known rate into a system of stainless steel pipes in which the pressure is maintained at about 80-120 psi (550-830 kN.m<sup>-2</sup>). Prior to passing through a static mixer, hydrocarbon foaming

agent is also continuously dosed into the mainstream of the base at the correct level to generate a gel of the correct ratio of base to foaming agent. The mixture then passes through a static and then through a dynamic mixer by which time the blend of base and foaming agent is thoroughly mixed. At this stage the mixture may not yet be a gel but may still remain as an homogenous liquid. The mixture is then piped to a storage cylinder, while still under pressure, where the pressure inside the cylinder is again maintained at 80-90 psi (550-620 kN.m<sup>-2</sup>). Gelling of the mixture may be immediate or may take anything up to 24 hours, depending on the formulation.

Although this is an ideal manufacturing process, it is also possible to generate a satisfactory gel by vigorously shaking all components in any vessel which can maintain pressures.

The final gel product is stored in a pressurised cylinder until it is filled under pressure into the final package. The resultant post-foaming shower gel product may be dispensed from a pressurised aerosol container or extruded from collapsible metal tubes or the like. Packaging can be any form of barrier pack or container which will withstand pressure such as the SEPRO, CONPACK or EXXEL packs, the EXXEL pack being preferred. (The words SEPRO, CONPACK and EXXEL are trade marks.) The EXXEL plastic container is a self-pressurised spray container containing an inflatable rubber bag inside, which eliminates the need for an outer propellant, and can be obtained from Container Industries, Inc., Somerset, N.J., U.S.A.

The following examples merely illustrate the invention, but it is understood that the invention is

not limited thereto. All amounts of various ingredients in the examples and elsewhere in the specification are by weight unless otherwise specified.

Example 1

Post-Foaming Shower Gel

5	<u>Base Ingredients</u>	<u>%</u>
	SLES <sup>1</sup>	18
	Ethoxylated lanolin alcohol <sup>2</sup>	6
	Sorbitol	3
10	Isopropyl myristate	3
	Water	to 100
	Perfume, colour	Q.S.
	<u>Product Ingredients</u>	
	Base	90%
15	Foaming agent	10%
	Foaming agent is a 2:1 blend of n-pentane and isobutane	
	1. sodium lauryl ether sulphate	
	2. polyoxyethylene (15) glycol ether of lanolin	
20	alcohol	

The water, sorbitol and the lanolin, which is a solid, are heated at a temperature of 60-65 °C until the lanolin is melted and a liquid mixture is formed, the liquid is removed from the heat and agitation is started. The SLES and isopropyl myristate are added to the liquid with continued mixing. The liquid mixture is allowed to cool down to a temperature below 35 °C prior to the addition of the colour and perfume which is mixed until fully dispersed in said liquid. The liquid dispersion is mixed with the hydrocarbon foaming agent in a pressurised mixer to form a firm, clear, ringing shower gel which provides rapid development of profuse amounts of foam, and which feels good on the skin.

Example 2Post-Foaming Shower Gel

<u>Ingredients</u>		<u>%</u>
<u>Base</u>		
5 Polychol 15 <sup>1</sup>		7.00
SLES 2EO (28% AI in water)		65.00
Sorbitol		3.00
Isopropyl myristate		3.00
Water		19.90
10 Perfume		2.00
Colour		0.10

Finished Product

	Base	90%
	Foaming Agent	10%
15	1. Polyoxyethylene (15) glycol ether of lanolin alcohol	
	Foaming agent is 2:1 blend of n-pentane and iso-butane	
	This composition is prepared in accordance with the process of Example 1.	
20	The final product is also a clear, firm, post-foaming shower gel capable of providing increased volume of foam which develops quickly on the skin and has a good feel.	

Examples 3 and 4Post-Foaming Shower Gel

25	<u>Base Ingredients</u>	<u>3</u>	<u>4</u>
	Ethoxylated Lanolin Alcohol		
	(POLYCHOL 15)	5.0	7.0
	Sodium Lauryl Ether Sulphate	17.0	20.0
30	Sorbitol - 70% solution	2.0	4.0
	Isopropyl Myristate	2.0	4.0
	Perfume	q.s	(Approx.2.0)
	Colouring Material		q.s
	Water		to 100.0

Product

The above base is then blended with a 2:1 mixture of n-pentane: iso-butane, in the ratio of 90 parts base to 10 parts foaming agent.

5 This product is prepared in accordance with the process of Example 1.

The final product is also a clear, firm, ringing gel with rapid, voluminous foaming properties and good slip properties on the skin.

10

GEL FORMULATIONSExamples 5-8

		<u>5</u>	<u>6</u>	<u>7</u>	<u>8</u>
	<u>Base Ingredients</u>				
15	SLES 2EO (28% AI in water)	94.0	80.0	50.0	15.0
	WATER	--	13.0	27.0	48.0
	PERFUME	2.0	2.0	2.0	2.0
	POLYCHOL (15) <sup>1</sup>	--	1.0	15.0	25.0
	IPM <sup>2</sup>	2.0	--	3.0	--
20	SORBITOL	2.0	3.0	3.0	10.0
	COLOUR	QS	QS	QS	QS

<sup>1</sup> Polyoxyethylene (15) glycol ether of lanolin alcohol

<sup>2</sup> Isopropyl myristate

25 The thin liquid base is gassed with 10% of a hydrocarbon blend foaming agent to complete gellation as described in Example 1.

30

Examples 9-12

	<u>9</u>	<u>10</u>	<u>11</u>	<u>12</u>
<u>Base Ingredients</u>				
5 SLES 2EO (28% AI in				
water)	65.0	85.0	65.0	65.0
WATER	19.902	5.902	19.902	22.902
PERFUME	2.0	2.0	2.0	2.0
BRIJ 30 <sup>1</sup>	7.0	1.0	--	--
ATLAS G1086 <sup>2</sup>	--	--	7.0	7.0
10 IPM	3.0	3.0	3.0	3.0
SORBITOL	3.0	3.0	3.0	--
COLOUR	QS	QS	QS	QS

<sup>1</sup> Polyoxyethylene (4) lauryl alcohol

15 <sup>2</sup> Polyoxyethylene sorbitol hexaoleate.

The thin liquid base is gassed with 10% of a hydrocarbon blend foaming agent to complete gellation as described in Example 1.

20 All of the above shower gels have good high temperature stability, increased volume and speed of foaming over conventional shower products, are low viscosity bases, feel good on the skin, are readily removable from the skin by rinsing with water, and  
25 leave a soft, smooth, clean after-feel; and can be packaged in any container which will withstand pressure, in particular barrier type containers.

It is understood that the foregoing detailed description is given merely by way of illustration and  
30 that variations may be made therein without departing from the spirit of the invention.

CLAIMS

1. A stable, post-foaming gel product, suitable for shower use, comprising a soap-free surfactant-based gel composition comprising a major amount of water, from 3 to 23% by weight of a water-soluble anionic alkali metal C<sub>10</sub>-C<sub>16</sub> alkyl ether sulphate surfactant, about from 1 to 24% by weight of a water dispersible ethoxylated fatty alcohol or fatty ester, and a saturated aliphatic hydrocarbon foaming agent having 4 to 5 carbon atoms as an integral part of the gel structure, the anionic surfactant and the ethoxylated fatty alcohol or ester being present in a weight ratio of from 4:1 to 1:4.

2. A gel product as claimed in claim 1, wherein the foaming agent is present in an amount of from 5 to 20% by weight.

3. A gel product according to Claim 1 or 2, comprising a thin liquid base comprising water, a water-soluble anionic surfactant, and a dispersible nonionic ethoxylated fatty alcohol or fatty ester, gelled with a hydrocarbon foaming agent.

4. A gel product according to Claim 3, wherein the base comprises from 60 to 75% by weight water.

5. A gel product according to Claim 3 or 4, wherein the base comprises from 4 to 26% by weight of the water-soluble anionic surfactant.

6. A gel product according to Claim 3, 4 or 5,



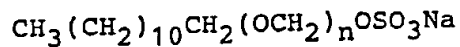
wherein the dispersible nonionic ethoxylated fatty alcohol or fatty ester is present in an amount of from 1 to 25% by weight.

5        7. A gel product according to any one of Claims 3 to 6, wherein the base is gelled with the hydrocarbon foaming agent in the weight ratio of 90% base to 10% foaming agent.

10       8. A gel product according to any one of Claims 1 to 7, wherein the foaming agent consists of a 2:1 blend of n-pentane and iso-butane.

15       9. A gel product according to any one of Claims 3 to 7, wherein the liquid base has a viscosity of from 100 to 1000 cps.

20       10. A gel product according to any one of Claims 1 to 9, wherein the anionic surfactant is sodium lauryl ether sulphate having the formula:



wherein n averages between 1 and 4.

25       11. A gel product according to any one of Claims 1 to 10, wherein the water dispersible nonionic ethoxylated fatty alcohol comprises the polyethylene glycol ether of lanolin alcohol with an ethoxylation value of 15.

30       12. A gel product according to any one of Claims 1 to 11, wherein the ethoxylated fatty alcohol comprises polyoxyethylene (4) lauryl alcohol.

13. A gel product according to any one of Claims 1 to 12, wherein the ethoxylated fatty ester comprises polyoxyethylene sorbitol hexaoleate.

5        14. A gel product according to any one of Claims 1 to 13, additionally containing from 2 to 4% by weight isopropyl myristate.

10       15. A gel product according to any one of Claims 1 to 14, additionally containing from 1 to 10% of a mono- or di-saccharide.

16. A gel product according to Claim 15, wherein the monosaccharide is sorbitol.

15

17 A method of preparing a gel product as defined in Claim 3, which method comprises forming a thin homogenous liquid base dispersion containing the water, the ethoxylated fatty alcohol or fatty ester, and the anionic surfactant, mixing the liquid base with the hydrocarbon foaming agent under pressure to form a post-foaming gel, wherein the foaming agent becomes an integral part of said gel structure.

25

18. A method according to Claim 17, wherein the post-foaming gel is maintained under pressure during the packaging of the gel into a container that will withstand pressure.

30

19. A gel product according to any one of Claims 1 to 16, packaged in a container adapted to contain the gel composition under pressure, the container containing an inflatable rubber bag inside which

functions as a self-pressurised spray without the use of outer propellant.

20. A gel product according to any one of Claims  
5 1 to 16, which is free of an outer propellant.

21. A gel product according to any one of Claims  
1 to 16, which is a clear or opaque, ringing to soft  
post-foaming gel which rapidly develops foam in copious  
10 amounts.

22. A gel product according to any one of Claims  
1 to 16, which consists substantially only of the  
ingredients listed.

15 23. A gel product substantially as herein  
described with reference to the examples.

24. A method of making a gel product substantially  
20 as herein described with reference to the examples.

25

30